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The Effect of Attentional Bias on Suggestibility

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THESIS

submitted to the Eberly College of Arts and Sciences
at West Virginia University
in partial fulfillment of the requirements for the degree of

Master of Science
in
Psychology

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ABSTRACT

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Elizabeth E. Stacom

Research implies that individuals with high anxiety levels may be more accurate in response to misleading questions when compared to individuals with low anxiety levels (Ridley & Clifford, 2004; Ridley, Clifford, & Keogh, 2002). This effect may be because individuals with high anxiety levels demonstrate an attentional memory bias toward threatening stimuli. The present study investigated whether a high versus low attentional bias affects suggestibility. Seventy participants completed a visual probe task to measure attentional bias. Next, participants were presented with 11 threatening pictures. Each picture was followed by a distractor task. Participants were then asked two misleading and two correctly leading questions about the preceding picture. Participants in the high and low attentional bias groups did not differ significantly in their accuracy scores in response to misleading questions.

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The Effect of Attentional Bias on Suggestibility

In the 1950's, the idea that individuals with anxiety might demonstrate inconsistent performance on memory tasks received empirical support (Calvin, Koons, Bingham, & Fink, 1955). Several theories have been proposed as to why anxiety may enhance or impair memory. One theory proposed by Morris, Davis, and Hutchings (1981) attributed impairments in performance on a course examination to the worry component associated with anxiety; participants' performance decreased when they expected that the course examination they were about to be given would be difficult and they would perform poorly. Worry describes the "cognitive elements of the anxiety experience, such as negative expectations and cognitive concerns about oneself, the situation at hand, and potential consequences" (Morris et al., 1981, p. 541). When an individual is worried about how he or she is being perceived by others, information processing is impacted and therefore performance is impaired (Baddeley, 1986).

A second explanation for the effect of anxiety on memory is the processing-efficiency theory (Eysenck & Calvo, 1992). According to this theory, high levels of anxiety activate a cognitive system that allocates additional processing resources to the task and improves performance. The idea that individuals with high anxiety levels expend extra effort to maintain processing effectiveness on a demanding task was empirically tested and supported by Elliman, Green, Rogers, and Finch (1997). However, when a task places extreme demands on working memory, the performance of participants with high anxiety levels has been shown to decrease. Darke (1988) found that readers with high anxiety levels could efficiently remember inferences in short narratives, but performance decreased when they had to remember inferences in long narratives.

A third theory that may explain the effects of anxiety on memory is the semantic network model proposed by Bower (1981, 1987). According to this conceptual cognitive model, information in long-term memory is stored in separate nodes in a network, and related nodes are connected to one another. Because each emotional state is represented by a node in the network, a specific emotional state activates other connecting, corresponding emotion nodes. Bower utilized this model to explain how an anxious mood state could activate attention towards threatening stimuli, and limit processing of anxiety-irrelevant stimuli, across a wide range of perceptual, attention, and memory tasks. This model suggests that individuals with high anxiety levels will be more likely to attend to threatening stimuli relative to those who have lower anxiety levels (Bower, 1981, 1987). Bower also theorized that individuals with high anxiety levels have stronger associations between anxiety nodes compared to with low anxiety levels. Therefore, according to Bower, increased attention to threatening stimuli and stronger associations between anxiety nodes in the network may improve memory performance for threatening stimuli in participants with high anxiety levels.

A fourth theory, described as stimulus equivalence, states that with exposure to certain contingencies, stimuli become related and form a stimulus class (Fields & Verhave, 1987). For instance, the spoken word “car,” a picture of a car, and the written word CAR are stimuli that refer to the same object, but are not in the same form. However, with learning either in a laboratory or in a natural setting, they become related to one another and form a stimulus class.

Class size refers to the number of stimuli within a given class and consists of nodes and singles (Fields & Verhave, 1987). Nodes are stimuli that are linked through

training to at least two other stimuli, and singles are stimuli linked through training to only one other stimulus. Thus, stimuli become members of an equivalence class through training (i.e., experiences; Leslie et al., 1993). Individuals with high anxiety levels may display vigilance for threatening stimuli because particular stimuli have previously been associated with threat. For instance, for a person who has been in a motor vehicle accident, the stimulus class for car may not only include the spoken word “car,” a picture of a car, and the written word CAR, but may also be linked with stimuli describing or depicting a car crash. Therefore, hearing the word “car” or viewing a picture of a car or the written word CAR may heighten arousal and anxiety because these stimuli are included in the same class and are associated with threatening stimuli.

Another theory was proposed by Beck and his colleagues (Beck & Clark, 1988; Beck & Emery, 1985). They proposed that individuals with high anxiety levels have certain schemata, defined as mental representations of experiences. These schemata are characterized by personal vulnerability and danger. When these schemata are activated, processing of threat-related information increases. However, schemata of vulnerability and danger are only active in stressful situations (Beck & Clark; Beck & Emery). This may indicate that an individual with high anxiety levels will display more attention to threatening information.

Anxiety Disorders and Attentional Bias

There is considerable evidence to suggest that individuals diagnosed with various anxiety disorders demonstrate an attentional bias, specifically an attentional bias for threatening information (MacLeod, Mathews, & Tata, 1986; Mathews & MacLeod, 1985; Mathews, Mogg, Kentish, & Eysenck, 1995). Attention to threat is thought to be a

behavior that is part of anxiety disorders (Beck, 1976; Eysenck, 1992; Williams, Watts, MacLeod, & Mathews, 1988). This attentional bias has been found in patients with generalized anxiety disorder (Mathews & MacLeod, 1985), panic disorder (McNally, Reiman, Louro, Lukach, & Kim, 1992), social anxiety disorder (Gilboa-Schechtman, Foa, & Amir, 1999), and posttraumatic stress disorder (Kaspi, McNally, & Amir, 1995; McNally, Amir, & Lipke, 1996). A variety of experimental tasks have been used to assess for attentional bias, including free recall, the dot-probe paradigm, the face-in-the-crowd measure, the modified Stroop task, and reaction time to homographs.

Individuals with generalized anxiety disorder (GAD) tend to have worries and concerns about multiple life issues. Research studies conducted with individuals with a GAD diagnosis have shown that individuals with this diagnosis do not consistently demonstrate an attentional bias for threatening stimuli and may only demonstrate an attentional bias when the stimuli presented are associated with a specific worry (Mathews & MacLeod, 1986). Attentional biases were evident when participants were presented with negative words (e.g., sadness, worthless) on a modified Stroop task (Bradley, Mogg, Millar, & White, 1995) and on a visual probe task (Mogg, Bradley, & Williams, 1995). During the modified Stroop task, participants were shown words in different colors and were asked to disregard the word meaning and instead name the color as quickly as possible. Response time is thought to reflect attention toward the word content. Longer response times indicate greater attention toward the specific words, thus delaying the time it takes to name the color. Individuals with high anxiety levels display longer response times when a threatening word is displayed compared to individuals with low anxiety levels (Mathews & MacLeod, 1985). In the visual probe task, two stimuli are

presented simultaneously (i.e., a threatening stimulus and a neutral stimulus) and a dot probe (: and/or ..) then replaces either the threatening or neutral stimulus. A positive attentional bias score indicates that the participant reacted faster when the probe replaced high-threat rather than low-threat pictures, which demonstrates an attentional bias towards threat (Mogg et al., 2000). Research suggests that participants with GAD who stated health concerns displayed an attentional bias for physical threat words on a modified Stroop task and patients with GAD who stated social worries displayed an attentional bias for social threat words on a visual probe task (Mogg, Mathews, & Eysenck, 1992). Thus, when comparing specific categories of threat words, such as words describing social threat (e.g., embarrassed, foolish) to those related to physical threat (e.g., cancer, illness) individuals with GAD display attentional biases consistent with their individual worries (Mathews & MacLeod, 1985).

In a study conducted by McNally, Foa, and Donnell (1989) participants with panic disorder and participants without a history of panic disorder were presented with threatening and non-threatening words. The researchers examined whether participants with panic disorder would display an attentional bias for the threatening words and if physiological arousal when viewing and recalling these words would affect this bias. Participants were asked to recall adjectives related to anxiety (i.e., nervous) and adjectives not related to anxiety (i.e., clever). Adjectives related to anxiety served as the threatening stimuli, whereas adjectives unrelated to anxiety served as the non-threatening stimuli. Heart rate and skin conductance changes were recorded at baseline and during the recall task. The researchers found that participants with panic disorder significantly recalled more threatening adjectives than non-threatening adjectives, and participants

without a history of panic disorder showed the opposite effect. Furthermore, arousal level did not affect attentional bias.

Individuals with social anxiety have also been shown to differentially attend to threatening stimuli, especially information that is relevant to interpersonal interactions. Using the modified Stroop task, participants with panic disorder and social anxiety disorder were presented with social and physical threat words and neutral words. Participants with panic disorder displayed longer reaction times when naming the color of physical threat words, and participants with social anxiety disorder displayed longer reaction times when naming the color of social threat words, compared to neutral words. Non-anxious control participants did not exhibit the same effect (Hope, Rapee, Heimburg, & Dombeck, 1990). In another study, participants with social anxiety disorder displayed longer reaction times when naming the color of words describing social threat (i.e., stupid) compared to words describing physical threat (i.e., pain; Lundh & Ost, 1996). This research provides further evidence that individuals with panic disorder and social anxiety disorder display a specific attentional bias for stimuli that are associated with respective threat cues.

The dot-probe paradigm (MacLeod, Mathews, & Tata, 1986) was utilized in a study by Asmundson and Stein (1994) to evaluate whether individuals with social anxiety displayed an attentional bias. The researchers found that individuals with social anxiety responded with a shorter reaction time to the probe after reading a social threat word, irrespective of where the probe was placed, providing some support for attentional bias. However, this study did not fully support the attentional bias hypothesis, because an attentional bias is only clearly evident when an individual exhibits a shorter reaction time

to the probe if it is located in the same position as a previous threat word (Gilboa-Schechtman et al., 1999).

Some researchers have used facial expressions instead of words as stimuli when examining attentional biases with individuals with social anxiety disorder (Gilboa-Schechtman et al., 1999). Facial expressions are thought to be more relevant stimuli than words because faces show direct emotional responses, whereas words are abstract representations of these social cues (Gilboa-Schechtman et al.). The face-in-the-crowd measure of attentional bias is another measure that has been utilized to assess attentional bias (Byrne & Eysenck, 1995). During this task, various facial expressions are presented to participants (Hansen & Hansen, 1988). On some trials, every face displays the same emotional expression, and during other trials, a “target” face displays a different emotional expression than all the rest (in the “crowd”) (Gilboa-Schechtman et al.). For these discrepant trials, participants are asked to point out the location of the “target” face (e.g., happy face in an angry crowd or angry face in a happy crowd). Researchers have found that individuals with social anxiety display longer reaction times when asked to identify angry faces and happy faces. This may indicate that individuals with social anxiety display greater attention when viewing any type of emotional expression (Gilboa-Schechtman et al.). This result indicates that individuals with social anxiety may find many emotional reactions threatening. Individuals may find happy faces to be as threatening as angry faces if happy faces are associated with a fear of being laughed at by others.

Posttraumatic stress disorder (PTSD) is characterized by spontaneous retrieval of traumatic memories in the form of intrusive thoughts, flashbacks, and nightmares

(American Psychiatric Association, 2000). Individuals with PTSD have been shown to exhibit an attentional bias for threat (Kaspi et al., 1995; McNally, English, & Lipke, 1993; Thrasher, Dalglish, & Yule, 1994). On a modified Stroop task, participants with combat-related PTSD (McNally et al.), rape-related PTSD (Cassiday et al.), and disaster-related PTSD (Thrasher et al.) take longer to name colors of trauma-related words compared to neutral, positive, or negative words unassociated with trauma.

Amir, Coles, and Foa (2002) studied trauma survivors with and without PTSD. These researchers found that traumatized individuals with a diagnosis of PTSD showed differences in their responses to threat-relevant information compared to individuals without a diagnosis of PTSD. Researchers have used homographs to examine attention towards or avoidance of threatening stimuli (Gernsbacher, Varner, & Faust, 1990). Homographs are words with more than one meaning (for example, “fair” can be an adjective used to describe light skin color or it can be a noun used to describe an exhibition). Participants are presented with a sentence ending in a homograph or nonhomograph, followed by a cue word (i.e., a threatening or non-threatening word), and asked to decide if the cue word was related to the meaning of the sentence. Slower reaction times in making decisions about a cue word following sentences ending in homographs (i.e., “The rookie got a hit”...“SMACK”) compared to cue words following sentences ending in nonhomographs (i.e., “The rookie got a fly-ball”...“SMACK”) represent attention towards the threatening meaning of the homograph. Faster reaction times in making a decision about a cue word following sentences ending in homographs compared to cue words following sentence ending in nonhomographs indicate avoidance. Thus, slower reaction times demonstrate that the participant is attending to the

threatening meaning of the homograph, whereas faster reaction times demonstrate that the participant is avoiding the threatening meaning of the homograph. When trauma-related homographs were presented for a very short duration (i.e., 100 ms), individuals with a diagnosis of PTSD were more apt to avoid the threat meanings of the homograph (i.e., had faster reaction times) compared to individuals without a diagnosis of PTSD (Amir et al.).

In summary, numerous studies utilizing a variety of methodologies have demonstrated that individuals with generalized anxiety disorder, social anxiety disorder, panic disorder, and posttraumatic stress disorder have been found to demonstrate an attentional bias for threatening stimuli.

Trait Anxiety, State Anxiety, and Attentional Bias

Trait anxiety is defined as relatively stable personality characteristic in which individuals display anxious behaviors (Spielberger, Gorsuch, & Lushene, 1970). A central theoretical assumption of the cognitive approach is that individuals who are high in trait anxiety experience higher levels of anxiety than those low in trait anxiety because individuals who are highly anxious display an attentional bias, which is the tendency to attend to threat-related over positive or neutral stimuli (Eysenck, 2004). Williams et al. (1988) found that participants who displayed high trait anxiety were attentive towards threat. The opposite pattern was displayed by individuals with low trait anxiety. Individuals with low trait anxiety did not demonstrate attention to threatening stimuli.

An attentional bias for threat stimuli might be an interactive function of trait and state anxiety, anxiety which is experienced in a specific situation (MacLeod & Mathews, 1988; Williams et al., 1988). However, it is unclear from this research whether trait or

state anxiety increases an attentional bias for threatening stimuli because individuals with high trait anxiety usually display high state anxiety as well.

To determine whether state anxiety produced an attentional bias, students with high and low trait anxiety were assessed at two separate time intervals: when state anxiety was low (at the beginning of the school semester), and when state anxiety was high (1 week before final exams; MacLeod & Matthews, 1988). On both testing occasions, they found that participants with high trait anxiety shifted their attention towards threatening stimuli compared to participants with low trait anxiety levels. This effect was stronger when the participants were tested right before exam time. Based on these results, the authors concluded that the attentional bias towards threat-relevant stimuli was an interactive function of trait and state anxiety. Thus, when compared to individuals with low trait anxiety, individuals with high trait anxiety have an attentional bias for threat and this bias is stronger when state anxiety is elevated.

The roles of trait and state anxiety have also been evaluated in laboratory settings (Mogg, Mathews, Bird, & Macgregor-Morris, 1990). The researchers examined whether participants with high and low trait anxiety displayed an attentional bias in high and low stress conditions. Participants were randomly assigned to a high stress condition (difficult math problem with false negative feedback) or low stress condition (easy math problem with false positive feedback). Participants who were under the high stress condition displayed attention towards threatening stimuli, irrespective of their trait anxiety level. This research indicates that state anxiety may increase attention to threatening stimuli, irrespective of trait anxiety. Thus, individuals with high state anxiety and not necessarily high trait anxiety demonstrate an attentional bias to threatening stimuli.

Mogg, Bradley, and Hallowell (1994) conducted a study in which they tested each participant under three different stress conditions: Under no stress, laboratory-induced stress, and examination-induced stress. The researchers tested for attentional bias in these stress conditions by utilizing two exposure conditions (i.e., masked and unmasked word stimuli) in a visual probe task. These word stimuli consisted of threatening (i.e., achievement related threat or physical threat), positive, or non-threatening word pairs. In the masked condition, each word pair was presented for 14 ms and then replaced by two sets of random letter pairs (i.e., masks). Each mask used (e.g., DMUWGH) was matched for word length with the preceding word pair. The dot probe then replaced the position of one of the two masks. In the unmasked condition, two words were presented for 500 ms and the dot probe replaced the position of one of the two words. Under the exam-stress condition, participants with high trait anxiety displayed an attentional bias toward threatening, unmasked stimuli compared with participants with low trait anxiety. This effect was not found under the laboratory-induced stress condition. According to Beck's (Beck & Clark, 1988; Beck & Emery, 1985) and Bower's (1981; 1987) theories, this attentional bias should have been evident across all stress-level conditions. It may be that the laboratory induced stress condition used in this study did not evoke a stressful response in participants with a high trait anxiety.

Bradley, Mogg, Falla, and Hamilton (1998) utilized a visual probe task to present face pairs to individuals with high and low trait anxiety. The facial expressions were either threatening (i.e., angry), happy, or neutral. Each pair was presented side by side using two exposure conditions (i.e., 500 and 1250 ms). Two exposure conditions were used to examine whether individuals with high trait anxiety demonstrate an attentional

bias when presented with threatening stimuli for shorter (i.e., 500 ms) as well as longer (i.e., 1250 ms) time intervals. Results indicated that individuals with high trait anxiety were more vigilant to threatening faces than happy faces across both exposure conditions. In a follow-up study (Mogg & Bradley, 1999b), shorter exposure times ranging from 14 to 34 ms were utilized. The face pairs were presented, and then masked, followed by a probe stimulus. Participants were asked to respond by pressing one of two keys to indicate whether the probe stimulus was displayed on the left or right side of the computer screen. They found that individuals with high trait anxiety responded to probes occurring in the spatial location of the masked threat, rather than the neutral faces, lending support to a preconscious bias for threat cues.

Rohner (2004) did not find support for the measurement of attentional bias using facial stimuli. In this study, participants were shown face pairs displaying different emotional reactions (i.e. angry, neutral, and happy) on a computer screen with each face pair presentation preceded by a neutral face. Using an eye-tracking device, eye movements were measured during the presentation of neutral faces and emotional faces. Results of this study indicated that individuals with high trait anxiety looked away from angry to happy faces. It may be that individuals with high trait anxiety first shift their attention to threatening stimuli, and then shift their attention away, to avoid threat (Rohner).

In summary, most of the aforementioned research studies indicate that individuals with high trait anxiety and state anxiety demonstrate an attentional bias for threatening stimuli. However, individuals with trait anxiety do not consistently demonstrate an attentional bias and this may be due to different methods of measuring attentional bias.

Anxiety, Attentional Bias, and Memory

Research on attentional biases in anxiety has focused on memory for threatening information. Theories developed by Beck and Emery (1985) and Bower (1981) state that anxious individuals should recall more negative information. To evaluate this hypothesis, participants either were exposed (i.e., primed condition) or not exposed (i.e., unprimed condition) to a list of threatening words (i.e., words describing physical and social threat) and non-threatening words (i.e., neutral and positive words). The participants were asked to complete a three-letter word stem using the first word that came to their mind (Matthews, Mogg, May, & Eysenck, 1989). For example, participants could be given the word stem MUT and CON, and may have completed the word by using a word from the list (i.e., MUTILATED and CONFIDENT, respectively). This word completion task measured whether participants in the primed condition would recall more threatening or non-threatening list words. The participants in the primed condition with low anxiety levels were more likely to complete the word stem for non-threat words compared to threat words and participants with high anxiety levels were more likely to complete the word stem for threat words rather than non-threat words, although this trend was not significant.

MacLeod (1990) conducted a study with participants with high and low anxiety levels. Threatening and non-threatening words were presented in a modified clinical Stroop paradigm in which the colors of the words printed had to be named. Memory was tested using a recognition memory task. Participants with high anxiety levels did not recall more threat words than participants with low anxiety.

An additional two studies (Dobson & Markman, 1992; Siegel & Loftus, 1978) also found little evidence of superior recall of threat-related stimuli by individuals with high anxiety levels. After viewing threat-related stimuli, participants were then questioned about the details of the previously viewed stimuli. The researchers found that participants with high anxiety levels recalled significantly less information on recognition memory tasks about crime-related stimuli. This demonstrates that individuals with high anxiety levels did not demonstrate superior recall for threatening stimuli.

Ready, Bothwell, and Brigham (1997) found a curvilinear relation between anxiety level at retrieval and face recognition accuracy in a photo lineup task. Participants with moderate levels of anxiety were more accurate on a line-up task than the participants with low or high levels of anxiety. Because of this curvilinear relation between anxiety level and accuracy, these findings imply that high and low levels of anxiety may negatively impact accuracy. This finding is not consistent with theories of attentional bias.

To summarize, nonclinical participants with high anxiety levels do not consistently display an attentional bias leading to greater recall of threatening information on memory tasks. If participants with high anxiety levels demonstrate an attentional bias for threatening information, it would seem more likely that they would have greater accuracy in recall of this information compared to individuals with lower levels of anxiety. The aforementioned research does not indicate that this is necessarily the case.

Anxiety and Suggestibility

Research has also evaluated how stressful events affect memory and suggestibility. More recently researchers have begun to examine the effects of participant

anxiety level on suggestibility. One study (Ridley, Clifford, & Keogh, 2002) found that children with high state anxiety levels were less suggestible than children with low state anxiety levels. Children were asked to watch a video of a car crash and then half of these children were provided with misinformation regarding the details of the video in the form of misleading questions. The children who received the misleading questions were then asked to respond to a separate set of short answer questions. Of the children who were given the misleading questions after viewing the video, those with high anxiety levels were significantly less likely to incorporate this misinformation into their short-answer responses compared to children with low anxiety levels. One explanation for reduced suggestibility at high anxiety levels is that children with high anxiety view misleading information as threatening because it differs from their own memories of the witnessed event (Ridley et al.). To examine accuracy, the children were also asked to answer correctly leading questions. There were no significant differences in accuracy for correctly leading questions between the high and low anxiety level groups.

A small amount of research has been conducted that examines how increased anxiety during encoding and retrieving information affects subsequent suggestibility. Ridley and Clifford (2004) addressed this matter by using four conditions to evaluate the effects of anxious mood and misleading information with an adult sample. To induce anxiety, the researchers video-recorded participants when they were being interviewed about the crime video they had watched. Participants could view their performance on a feedback monitor, and were instructed that their performance as witnesses would be assessed by a mock jury. This anxiety induction was presented either at the time the participants were encoding misleading information, retrieving misleading information, at

both encoding and retrieval, or during neither occasion. Results indicated that state anxiety significantly reduced the number of misleading responses to suggestive questions at both the encoding and retrieval stages.

In another study (Ridley & Clifford, 2006), investigators examined the effect of state anxiety on suggestibility utilizing the source identification method (Zaragoza & Lane, 1994). This method asks participants to state the source of the misleading information (i.e., whether it was in the witnessed event, in the subsequent questioning or narratives, both, or neither). The researchers found no significant differences in source memory when the question indicated the correct source of knowledge for any of the four categories in state or trait anxiety. However, as state anxiety increased, source misattributions decreased. Due to these findings, the authors suggest that anxiety is only related to memory for source when the incorrect source is presented.

The findings of the research conducted suggest that individuals with high anxiety levels are less likely to be suggestible. In addition, individuals with high anxiety levels have been shown to display an attentional bias. To date, research has not examined the effects of attentional bias on suggestibility. This would be an important first step in attempting to determine the relation between anxiety, attentional bias, and suggestibility. If individuals with high anxiety levels demonstrate lower suggestibility, it may be that an attentional bias is accounting for this effect.

Purpose

This study examined the relation between anxiety, attentional bias, and suggestibility to determine whether the demonstration of a high or low attentional bias to threatening stimuli would affect suggestibility. Participants were evaluated to determine

if they displayed a high or low attentional bias to threat. Anxiety was also measured to evaluate if high anxiety levels were associated with an attentional bias. If a relation was found between attentional bias and suggestibility, it would be determined whether anxiety accounted for this finding. Participants with a high attentional bias to threat were compared to those with a low attentional bias to threat to determine if these two groups displayed differential levels of suggestibility.

Method

Participants

Participants were 132 undergraduate students who were enrolled in psychology classes at West Virginia University. There were 35 participants in the LAB group and 87 participants in the HAB group. All 35 participants in the LAB group were included in the analysis. To have equal numbers of participants in each group and to maximize the difference of the attentional bias scores between the two groups to ensure that the two groups were heterogeneous, 35 of the 87 participants in the HAB group with the highest attentional bias scores were selected for the final sample. Of the 132, data from 70 students were selected for the analyses.

In the final sample, 82.9% of the participants were female and 90% of the participants were Caucasian. The average age was 20-years-old and participants ranged from 18-years-old to 29-years-old. Participants received extra-credit in their respective psychology class for participation in this study.

Measures

Anxiety. Anxiety symptoms were measured by the Mood and Anxiety Symptom Questionnaire (MASQ; Clark & Watson, 1991). The MASQ includes 90 items selected

from the symptom criteria for anxiety and mood disorders outlined in the *Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R*; American Psychiatric Association, 1987; Watson et al., 1995). One item regarding suicidal ideation was removed from the questionnaire to decrease liability. Participants indicated on a 1 to 5 scale (1 = *not at all*, 5 = *extremely*) whether they had experienced each symptom "during the past week, including today." The MASQ can be grouped into six subscales (Watson et al.). The General Distress: Mixed Symptom scale (GD: M) includes 15 items that appear in the criteria for both anxiety and mood disorders (Watson et al.). The General Distress: Anxious Symptoms (GD: A) has 11 items which measure anxious mood and other nonspecific anxiety symptoms. The General Distress: Depressive Symptoms (GD: D) includes 12 items specific to depressed mood and other nonspecific symptoms. The three remaining scales focus on specific anxiety or depressive symptoms. The Anxious Arousal Scale (AA) contains 17 items which measure somatic tension and hyperarousal. The Anhedonic Depression Scale (AD) contains 8 specific symptoms of depression and the High Positive Affect Scale (PA) contains 24 items that directly assess positive emotional experiences.

For the purposes of this research study, only the GD: A and AA total scores were used. Research studies indicate that these scales correlate well with one another; the AA Scale correlates range from .68 to .78 ($M = .72$) with the GD: A Scale (Watson et al., 1995). The internal consistency (coefficient alphas) for the GD: A Scale is .81 and .87 for the AA Scale (Watson et al.). Anxiety Scales on the MASQ correlate highly with other well-established anxiety scales (Hopkins Symptom Checklist, Profile of Mood States, Beck Anxiety Inventory, Hospital Anxiety and Depression Scale). An analysis of

convergent validity between the above anxiety measures and the MASQ Anxiety Scales revealed that the AA Scale displayed an average convergent validity correlation of .76 and the GD: A Scale showed an average correlation of .67 (Watson et al.). The MASQ was given so that the scores on the two anxiety measures could be used as covariates if participants with a high attentional bias differed significantly from those with a low attentional bias.

International Affective Picture System (IAPS, Lang, Bradley, & Cuthbert, 2005). The International Affective Picture System (IAPS) provides ratings of affective arousal for 960 emotionally-evocative color photographs. Emotionality is composed of three dimensions: valance (i.e., pleasant to unpleasant), arousal (i.e., calm to excited) and dominance (i.e., control). Each picture has been assigned normative ratings for each of the three dimensions based on previous research (Lang et al.). Pictorial stimuli were selected on the basis of valence and arousal norms. The valence and arousal means (with standard deviations in parentheses) for the high threat pictures were 2.27 (1.45) and 6.08 (2.22), respectively. The valence and arousal means (with standard deviations in parentheses) for the low threat pictures were 5.31 (1.38) and 3.35 (1.95), respectively.

The IAPS was utilized in a probe detection task to measure attentional bias. Participants viewed thirty-two picture pairs. Each picture pair was comprised of one unpleasant, high arousal (i.e., high threat) picture and one neutral (i.e., low threat) picture. Ten additional picture-pairs were selected as practice items. Data from this measure were utilized to form two groups (high vs. low attentional bias) to evaluate whether having a high attentional bias had an effect on suggestibility.

Suggestibility Questionnaire. Forty questions (see Appendix) were developed that inquired about the 10 unpleasant, high arousal pictures that were shown as to-be-remembered stimuli. Twenty of these questions were misleading and 20 questions were correctly leading. There was also one practice trial consisting of two correctly leading and two misleading questions. These 11 pictures were utilized because of their high arousal ratings. The pictures also depicted individuals interacting with their environment and were thought to reflect real-world experiences.

Procedure

Consent and Study Purpose. Participants first provided written consent to participate. The consent form informed prospective participants that the experimental session contained a variety of visual stimuli in the form of pictures, some of which may be unpleasant. They were informed that the study is investigating “how we process visual stimuli.”

Demographics Questionnaire. After providing consent, participants completed a brief demographics questionnaire on a computer. The questionnaire inquired about their birth date, age, year in school, and whether they have been diagnosed with or suspect they have any learning, visual, or attention problems. If participants responded affirmatively to the questions regarding learning, visual, or attention problems, their data were not included in the analysis. No data were eliminated due to a positive response to these questions.

Assessment of Anxiety. Participants completed the MASQ to measure anxiety. Participants indicated to what extent they had experienced each symptom (1 = *not at all*, 5 = *extremely*) "during the past week, including today."

Attentional bias/IAPS visual probe task. Following the MASQ, participants were given the IAPS visual probe task to measure attentional bias. Each trial of the IAPS visual probe task began with a central fixation cross presented for 1 second followed by a picture pair consisting of one unpleasant, high arousal picture and one neutral picture, displayed for 500 ms. Instantaneously, a probe stimulus (.. or :) was presented in the location of the center of one of the two pictures. Ten practice picture-pairs were presented, followed by the 32 experimental picture-pairs. Participants were asked to respond by pressing the “1” key to indicate that the probe displayed was horizontal or the “2” key to indicate that the probe displayed was vertical. Participants were instructed to respond as quickly as possible without making any mistakes. The probe was shown until a response occurred. Pictorial stimuli for the practice items were different from the stimuli used to measure attentional bias. Participants who displayed a high attentional bias (0 ms or above) and those with a low attentional bias (less than 0 ms) were included in the High Attentional Bias group (HAB) and Low Attentional Bias group (LAB) respectively. Criteria for the division of participants into attentional bias groups were based on the division of groups used in Mogg, Bradley, Miles, and Dixon (2004).

To-be-remembered stimuli and suggestibility questions. After the attentional bias task, 11 pictures were presented. Pictures 2 through 11 were presented in a random order and served as the to-be-remembered stimuli that participants were questioned about later in the session. Participants were asked questions about the first picture but responses to the questions about the first picture were not included in the analyses. This is because participants would not expect to receive questions about the first picture whereas they would expect to respond to questions regarding the subsequent pictures. Pictures 2-11

included 10 of the 32 unpleasant, high arousal pictures that were included in the experimental trials to measure attentional bias. Use of the same stimuli for the attentional bias task and suggestibility task was deemed important in order to be sure that individuals displayed an attentional bias regarding the items about which they will be questioned. Each picture was presented for five seconds, as done by Siegel and Loftus (1978). Between each picture presentation, a 2-minute distractor task consisting of travel stories was displayed on the computer screen. After the distractor task, participants were asked four questions (two misleading, two correctly leading) about each picture. The questions appeared on the computer screen and participants were asked to indicate their response by using the keyboard.

Visual Stimuli Questionnaire. This was constructed for the purposes of this study. Participants were asked to provide responses regarding their processing of the IAPS pictorial stimuli used in the suggestibility task. This served as a check to evaluate whether participants reported processing the stimuli that served as the to-be-remembered materials.

Debriefing. When participants completed the study, they were provided their credit and informed about the purpose of the study. They were asked not to discuss the study with other psychology students because these students might be participants in the future.

Results

Preparation of Attentional Bias Data

Attentional bias scores were calculated for each participant by subtracting the mean reaction time when the dot probe was in the same position as the high threat picture

from the mean reaction time when the dot probe was in the same position as the low-threat picture (MacLeod et al., 1986). A high (i.e., positive) attentional bias score indicates that the participant reacted faster when the probe replaced high-threat rather than low-threat pictures which demonstrates an attentional bias towards threat (Mogg & Bradley, 1999a). Alternatively, a low (i.e., negative) attentional bias score demonstrates an attentional bias away from threat. One bias score was calculated for each participant. Mean bias scores for each group are shown in Table 1.

The groups were determined according to the following criteria: (a) Low Attentional Bias group (LAB), with attentional bias scores less than 0 ms; (b) High Attentional Bias group (HAB), with attentional bias scores greater than or equal to 0 ms. Data from five participants could not be used due to computer program errors.

After the removal of the data with errors, there were 35 participants in the LAB group and 87 participants in the HAB group. All 35 participants in the LAB group were included in the analysis. To have equal numbers of participants in each group and to maximize the difference of the attentional bias scores between the two groups to ensure that the two groups were heterogeneous, 35 of the 87 participants in the HAB group with the highest attentional bias scores were included in the final analyses.

Preparation of Anxiety Data

Anxiety scores were calculated separately for GD: A and AA Scales using the scoring key for the Mood and Anxiety Symptom Questionnaire. Mean anxiety scores for the LAB group and HAB group are shown in Table 1.

Preparation of Suggestibility Data

Two questions had to be removed from the misleading and correctly leading question pool because the same question was repeated in the experiment for picture numbers 6831 and 9429 (“A man had blood on his chest, didn’t he?”; see Appendix). Accuracy scores were calculated for the 19 misleading questions and the 19 non-misleading questions. Mean scores for the number of correct responses to misleading questions and correct responses to correctly leading questions for each group (i.e., LAB and HAB) were calculated and are shown in Table 1.

Correlations

Table 2 presents the intercorrelations between all variables. Analyses indicate attentional bias was not significantly correlated with scores on the GD: A and AA Scales, scores on misleading and correctly leading questions, and total suggestibility score.

Analyses of Variance

To evaluate whether the number of correct responses to misleading questions significantly differed between the high versus the low attentional bias group, a univariate analysis of variance (ANOVA) was conducted with the number of correct responses to misleading questions as the dependent variable and attentional bias group as the independent variable (LAB, HAB). The ANOVA was not significant, $F(1, 68) = 0.65$, $p = .799$, $\eta_p^2 = .001$.

To evaluate whether the number of correct responses to correctly leading questions significantly differed between the high versus the low attentional bias group, a separate univariate analysis of variance (ANOVA) was conducted with the number of correct responses to correctly leading questions as the dependent variable and attentional

bias group as the independent variable (LAB, HAB). The ANOVA was not significant, $F(1, 68) = 0.93, p = .761, \eta_p^2 = .001$.

Discussion

This study examined whether participants with a high attentional bias displayed differential levels of suggestibility than those with a low attentional bias. Participants in the Low Attentional Bias group (LAB) and High Attentional Bias group (HAB) did not differ significantly in accuracy for misleading and correctly leading questions. The responses to the misleading and correctly leading questions for the LAB group and HAB were very similar. This could be explained by the repetition of the picture presentation. That is, participants viewed the picture stimuli in the attentional bias task and as part of the suggestibility task. To reduce this effect on the results, further experimentation may benefit from a delay between the attentional bias and suggestibility task.

Additionally, participants in this study were moderately accurate in their responses to misleading and correctly leading questions. The percentage of correct responses to the misleading and correctly leading questions for the LAB group was 77% and 81%, respectively. The percentage of correct responses to the misleading and correctly leading questions for the HAB group was 76% and 82%, respectively. One explanation for the moderate levels of accuracy is the emotional salience effect (Dolan, 2002; Hamann, 2001). This effect is seen when individuals pay more attention to highly emotional stimuli (i.e., positive or negative stimuli) compared to neutral stimuli. Individuals may have enhanced memory for emotionally salient events because of increased attention, rehearsal, and elaboration (Hamann, 2001). Research indicates that young adults (mean age of 22 years, range 17–39) paid more attention to and had higher

accuracy in recall and recognition tasks for emotionally valenced stimuli than neutral stimuli. Furthermore, compared to older adults (mean age 71 years, range 55–94), younger adults displayed higher accuracy in their responses to previously viewed negative stimuli (Murphy & Isaacowitz, 2008).

Participants in this study completed the attentional bias task and then completed the suggestibility task shortly after. Therefore, all participants viewed the pictures used for the suggestibility task twice. The first time the 11 suggestibility pictures were presented for 500 ms in the attentional bias task, and the second time the 11 suggestibility pictures were presented for 5 s. This repeated exposure may have allowed for greater attention to the suggestibility pictures, thereby reducing incorrect responses to the misleading questions. Participants also may have realized they were being tested on their memory for each picture and therefore carefully attended to each picture in the suggestibility task. After viewing the first picture, completing the distractor task, and answering the four subsequent questions, participants may have learned to attend to each picture because they wanted to respond accurately when the questions were presented.

The mean GD: General Anxiety and Anxious Arousal scores were not significantly different between the LAB group and the HAB group. The research on anxiety and attentional bias indicates that individuals with high anxiety scores should demonstrate a high attentional bias (Bradley et al., 1998, MacLeod & Mathews, 1988). This was not found in this study, suggesting that this sample of participants may not be representative.

References

- American Psychiatric Association. (2000). Posttraumatic stress disorder. *Diagnostic and statistical manual of mental disorders* (4th ed. text revision). Washington, D.C.: Author.
- Asmundson, G. J., & Stein, M. B. (1994). Selective processing of social threat in patients with generalized social phobia: Evaluation using a dot-probe paradigm. *Journal of Anxiety Disorders*, 8, 107-117.
- Amir, N., Coles, M. E., & Foa, E. B. (2002). Automatic and strategic activation and inhibition of threat-relevant information in posttraumatic stress disorder. *Cognitive Therapy and Research*, 26, 645-655.
- Baddeley, A. (1986). *Working memory*. NY, NY: Clarendon Press/Oxford University Press.
- Beck, A. T. (1976). *Cognitive therapy and the emotional disorders*. Oxford, England: International Universities Press.
- Beck, A. T., & Clark, D. A. (1988). Anxiety and depression: An information processing perspective. *Anxiety Research*, 1, 23-36.
- Beck, A. T., & Emery, G. (1985). *Anxiety disorders and phobias: A cognitive perspective*. NY, NY: Basic Books.
- Bower, G. H. (1981). Mood and memory. *The American Psychologist*, 36, 129-148.
- Bower, G. H. (1987). Commentary on mood and memory. *Behaviour Research and Therapy*, 25, 443-455.
- Bradley, B. P., Mogg, K., Falla, S. J., & Hamilton, L. R. (1998). Attentional bias for threatening facial expressions in anxiety: Manipulation of stimulus duration.

Cognition and Emotion, 12, 737-753.

Bradley, B. P, Mogg, K., Millar, N., & White, J. (1995). Selective processing of negative information: Effects of clinical anxiety, concurrent depression, and awareness.

Journal of Abnormal Psychology, 104, 532-536.

Calvin, A. D., Koons, P. B. Jr., Bingham, J. L., & Fink, H. H. (1955). A further investigation of the relationship between manifest anxiety and intelligence. *Journal of Consulting Psychology*, 19, 280-282.

Clark, L. A., & Watson, D. (1991). Tripartite model of anxiety and depression: Psychometric evidence and taxonomic implications. *Journal of Abnormal Psychology*, 100, 316-336.

Darke, S. (1988). Anxiety and working memory capacity. *Cognition and Emotion*, 2, 145-154.

Dobson, M., & Markham, R. (2001). Individual differences in anxiety level and eyewitness memory. *The Journal of General Psychology*, 119, 343-350.

Dolan, R. J. (2002). Emotion, cognition, and behavior. *Science*, 298, 1191-1194.

Elliman, N. A., Green, M. W., Rogers, P. J., & Finch, G. M. (1997). Processing-efficiency theory and the working memory system: Impairments associated with sub-clinical anxiety. *Personality and Individual Differences*, 23, 31-35.

Eysenck, M. W. (1992). The nature of anxiety. In A. Gale & M. W. Eysenck (Eds.), *Handbook of individual differences: Biological perspectives* (pp. 157-178). Oxford, England: John Wiley & Sons.

Eysenck, M. W. (2004). Trait anxiety, repressors and cognitive biases. In J. Yiend (Ed.), *Cognition, emotion and psychopathology: Theoretical, empirical and clinical*

- directions* (pp. 49-67). NY, NY: Cambridge University Press.
- Eysenck, M. W., & Calvo, M. G. (1992). Anxiety and performance: The processing efficiency theory. *Cognition and Emotion*, 6, 409-434.
- Fields, L., & Verhave, T. (1987). The structure of equivalence classes. *Journal of the Experimental Analysis of Behavior*, 48, 317-332.
- Gernsbacher, M. A., Varner, K. R., & Faust, M. E. (1990). Investigating differences in general comprehension skill. *Journal of Experimental Psychology*, 3, 430-445.
- Gilboa-Schechtman, E., Foa, E. B., & Amir, N. (1999). Attentional biases for facial expressions in social phobia: The face-in-the-crowd paradigm. *Cognition and Emotion*, 13, 305-318.
- Hamann, S. (2001). Cognitive and neural mechanisms of emotional memory. *Trends in Cognitive Sciences*, 5, 394-400.
- Hansen, C. H., & Hansen, R. D. (1988). Finding the face in the crowd: An anger superiority effect. *Journal of Personality and Social Psychology*, 54, 917-924.
- Hope, D. A., Rapee, R. M., Heimberg, R. G., & Dombeck, M. J. (1990). Representations of the self in social phobia: Vulnerability to social threat. *Cognitive Therapy and Research*, 14, 177-189.
- Kaspi, S. P., McNally, R. J., & Amir, N. (1995). Cognitive processing of emotional information in posttraumatic stress disorder. *Cognitive Therapy and Research*, 19, 433-444.
- Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (2005). *International affective picture System (IAPS): Affective ratings of pictures and instruction manual. Technical report A-6*. University of Florida, Gainesville, FL.

- Leslie, J. C., Tierney, K. J., Robinson, C. P., Keenan, M., Watt, A., & Barnes, D. (1993). Differences between clinically anxious and non-anxious subjects in a stimulus equivalence training task involving threat words. *Psychological Record*, 43, 153-161.
- Lundh, L. G., & Öst, L. G. (1996b). Stroop interference, self-focus, and perfectionism in social phobics. *Personality and Individual Differences*, 20, 725-731.
- MacLeod, C. (1990). Mood disorders and cognition. In M. W. Eysenck (Ed.), *Cognitive psychology: An international review* (pp. 9-56). Oxford, England: John Wiley & Sons.
- MacLeod, C., & Mathews, A. (1988). Anxiety and the allocation of attention to threat. *The Quarterly Journal of Experimental Psychology. A Human Experimental Psychology*, 40, 653-670.
- MacLeod, C., Mathews, A., & Tata, P. (1986). Attentional bias in emotional disorders. *Journal of Abnormal Psychology*, 95, 15-20.
- Mathews, A., & MacLeod, C. (1985). Selective processing of threat cues in anxiety states. *Behaviour Research and Therapy*, 23, 563-569.
- Mathews, A., & MacLeod, C. (1986). Discrimination of threat cues without awareness in anxiety states. *Journal of Abnormal Psychology*, 95, 131-138.
- Mathews, A., Mogg, K., Kentish, J., & Eysenck, M. (1995). Effect of psychological treatment on cognitive bias in generalized anxiety disorder. *Behaviour Research and Therapy*, 33, 293-303.
- Mathews, A., Mogg, K., May, J., & Eysenck, M. (1989). Implicit and explicit memory bias in anxiety. *Journal of Abnormal Psychology*, 98, 236-240.
- McNally, R. J., Amir, N., & Lipke, H. J. (1996). Subliminal processing of threat cues in

posttraumatic stress disorder? *Journal of Anxiety Disorders*, 10, 115-128.

McNally, R. J., English, G. E., & Lipke, H. J. (1993). Assessment of intrusive cognition in PTSD: Use of the modified Stroop paradigm. *Journal of Traumatic Stress*, 6, 33 - 41.

McNally, R. J., Foa, E. B., & Donnell, C. D. (1989). Memory bias for anxiety information in patients with panic disorder. *Cognition and Emotion*, 3, 27-44.

McNally, R. J., Riemann, B. C., Louro, C. E., Lukach, B. M., & Kim, E. (1992). Cognitive processing of emotional information in panic disorder. *Behaviour Research and Therapy*, 30, 143-149.

Mogg, K., & Bradley, B. P. (1999a). Some methodological issues in assessing attentional biases for threatening faces in anxiety: A replication study using a modified version of the probe detection task. *Behaviour Research and Therapy*, 37, 595-604.

Mogg, K., & Bradley, B. P. (1999b). Selective attention and anxiety: A cognitive-motivational perspective. In T. Dalgleish, & M. J. Power (Eds.), *Handbook of cognition and emotion* (pp. 145-170). NY, NY: John Wiley & Sons Ltd.

Mogg, K., Bradley, B. P., Dixon, C., Fisher, S., Twelftree, H., & McWilliams, A. (2000). Trait anxiety, defensiveness and selective processing of threat: an investigation using two measures of attentional bias. *Personality and Individual Differences*, 28, 1063-1077.

Mogg, K., Bradley, B. P., & Hallowell, N. (1994). Attentional bias to threat: Roles of trait anxiety, stressful events, and awareness. *The Quarterly Journal of Experimental Psychology*, 47A, 841-864.

Mogg, K., Bradley, B. P., Miles, F., & Dixon, R. (2004). Time course of attentional

- bias for threat scenes: Testing the vigilance-avoidance hypothesis. *Cognition and Emotion*, 18, 689-700.
- Mogg, K., Bradley, B. P., & Williams, R. (1995). Attentional bias in anxiety and depression: The role of awareness. *British Journal of Clinical Psychology*, 34, 17-36
- Mogg, K., Mathews, A., Bird, C., & Macgregor-Morris, R. (1990). Effects of stress and anxiety on the processing of threat stimuli. *Journal of Personality and Social Psychology*, 59, 1230-1237.
- Mogg, K., Mathews, A., & Eysenck, M. (1992). Attentional bias to threat in clinical anxiety states. *Cognition and Emotion*, 6, 149-159.
- Morris, L. W., Davis, M. A., & Hutchings, C. H. (1981). Cognitive and emotional components of anxiety: Literature review and a revised worry-emotionality scale. *Journal of Educational Psychology*, 73, 541-555.
- Murphy, N. A., & Isaacowitz, D. A. (2008). Preferences for emotional information in older and younger adults: A meta-analysis of memory and attention tasks. *Psychology and Aging*, 23, 263-286.
- Ready, D. J., Bothwell, R. K., & Brigham, J. C. (1997). The effects of hypnosis, context reinstatement, and anxiety on eyewitness memory. *The International Journal of Clinical and Experimental Hypnosis*, 45, 55-68.
- Ridley, A. M., & Clifford, B. R. (2004). The effects of anxious mood induction on suggestibility to misleading post-event information. *Applied Cognitive Psychology*, 18, 233-244.
- Ridley, A. M., & Clifford, B. R. (2006). Suggestibility and state anxiety: How the two concepts relate in a source identification paradigm. *Memory*, 14, 37-45.

- Ridley, A. M., Clifford, B. R., & Keogh, E. (2002). The effects of state anxiety on the suggestibility and accuracy of child eyewitnesses. *Applied Cognitive Psychology*, *16*, 547-558.
- Rohner, J. C. (2004). Memory-based attentional biases: Anxiety is linked to threat avoidance. *Cognition and Emotion*, *18*, 1027-1054.
- Siegel, J. M., & Loftus, E. F. (1978). Impact of anxiety and life stress upon eyewitness testimony. *Bulletin of the Psychonomic Society*, *12*, 479-480.
- Spielberger, C. D., Gorsuch, R. L., & Lushene, R.E. (1970). *State-Trait Anxiety Inventory manual*. Palo Alto, CA: Consulting Psychologists Press, Inc.
- Thrasher, S. M., Dalgleish, T., & Yule, W. (1994). Information processing in post-traumatic stress disorder. *Cognitive Therapy and Research*, *32*, 247-254.
- Watson, D., Clark, L. A., Weber, K., Assenheimer, J. S., Strauss, M. E., & McCormick, R. A. (1995). Testing a tripartite model: II. Exploring the symptom structure of anxiety and depression in student, adult, and patient samples. *Journal of Abnormal Psychology*, *104*, 15-25.
- Watson, D., Weber, K., Assenheimer, J. S., Clark, L. A., Strauss, M. E., & McCormick, R. A. (1995). Testing a tripartite model: I. Evaluating the convergent and Discriminant validity of anxiety and depression symptom scales. *Journal of Abnormal Psychology*, *104*, 3-14.
- Williams, J. M. G., Watts, F. N., MacLeod, C., & Mathews, A. (1988). *Cognitive psychology and emotional disorders*. Oxford, England: John Wiley & Sons.
- Zaragoza, M. S., & Lane, S. M. (1994). Source misattributions and the suggestibility of eyewitness memory. *Journal of Experimental Psychology: Learning, Memory, and*

Cognition, 20, 934-945

Table 1.

Attentional Bias Scores in Milliseconds, Anxiety Scores, and Number of Correct Responses to Yes/No Questions by Group

	<u>Low Attentional Bias (n = 35)</u>		<u>High Attentional Bias (n = 35)</u>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Attentional Bias Scores	-160.97	184.57	272.62	180.03
General Distress (GD)	23.05	6.51	21.22	6.61
Anxious Arousal (AA)	27.08	7.44	27.74	10.33
Misleading Questions	14.62	2.60	14.45	2.99
Correctly Leading Questions	15.42	1.65	15.54	1.48

Table 2.

Intercorrelations Between Variables

	Misleading Questions	Correctly Leading Questions	Total Suggestibility	GD:A Score	AA Score
Attentional Bias	-.031	-.037	-.009	-.140	-.037
Misleading Questions		.085	.883**	-.106	.007
Correctly Leading Questions			.543**	-.010	.108
Total Suggestibility				-.094	.057
GD: A Score					.694**

**p < .01.

Appendix

IAPS Negative Slides and Corresponding Suggestive Questions

Negative Slide Number: Practice Item 9520

Questions (CL):

1. One boy had long hair, didn't he?
2. There were two boys in the picture, weren't there?

Questions (ML):

1. One boy was holding a long stick, wasn't he?
2. One boy was standing on a log, wasn't he?

Negative Slide Number: 6312

Questions (CL):

3. The woman was forced into a vehicle, wasn't she?
4. The man grabbed the woman around the chest, didn't he?

Questions (ML):

3. The woman grabbed the man's legs, didn't she?
4. There were handcuffs in the vehicle, weren't there?

Negative Slide Number: 6315

Questions (CL):

1. The man and woman were in a parking lot, weren't they?
2. The man was choking the woman, wasn't he?

Questions (ML):

1. The man was grabbing the woman's arm, wasn't he?
2. The woman slapped the man, didn't she?

Negative Slide Number: 6831

Questions (CL):

1. A man was on the ground, wasn't he?
2. A man had blood on his chest, didn't he?

Questions (ML):

1. There was blood on the wall, wasn't there?
2. The cop was holding a gun, wasn't she?

Negative Slide Number: 6838

Questions (CL):

1. There were two people on the ground, weren't there?
2. The truck's door was open, wasn't it?

Questions (ML):

1. The police was holding a gun to a person, wasn't he?
2. The little girl on the ground was screaming, wasn't he?

Negative Slide Number: 6840

Questions (CL):

1. The prisoner had duck tape on his face, didn't he?
2. The policeman was watching the prisoner, wasn't he?

Questions (ML):

1. The prisoner's face was touching the lawyer's face, wasn't it?
2. There were three police men present, weren't there?

Negative Slide Number: 9050

Questions (CL):

1. The plane was on fire, wasn't it?
2. The floatation devices were activated, weren't they?

Questions (ML):

1. There were bodies on the ground, weren't there?
2. There was snow on the ground, wasn't there?

Negative Slide Number: 9250

Questions (CL):

1. The doctor's were wearing white coats, weren't they?
2. The boy's upper-body was covered in blood, wasn't it?

Questions (ML):

1. The boy was shot, wasn't he?
2. The doctor's were trying to revive the boy, weren't they?

Negative Slide Number: 9429

Questions (CL):

1. Parents were holding their children, weren't they?
2. It was raining, wasn't it?

Questions (ML):

1. A father picked up his child, didn't he?
2. A man was chasing the mothers and their children, wasn't he?
(This question was not used in the experiment, instead "A man had blood on his chest, didn't he?" was incorrectly entered into the computer program)

Negative Slide Number: 9903

Questions (CL):

1. A vehicle rolled over, didn't it?
2. Firefighters were on the scene, weren't they?

Questions (ML):

1. There was a tree partially covering the vehicle, wasn't there?
2. The vehicle lost a tire, didn't it?

Negative Slide Number: 9921

Questions (CL):

1. The person pulled from the fire was not wearing any clothing, wasn't she?
2. A firefighter was on the ladder, wasn't he?

Questions (ML):

1. The roof of the house was caving in, wasn't it?
2. The person rescued was wearing an oxygen mask, wasn't she?